$Ba_{0,6}K_{0,4}BiO_3$ single crystal as a multiple Josephson system: new coherent effect

L.N. Zherikhina[a], A.M. Tskhovrebov[a], L.A. Klinkova[b], D.A. Balaev[c], S.I. Popkov[c], and K.A. Shaikhutdinov[c]

[a]P.N.Lebedev Physical Institute of the Russian Academy of Sciences, Moscow, Russia
[b]Institute of Solid State Physics of the Russian Academy of Sciences, Chernogolovka, Russia
[c]Kirensky Institute of Physics, Siberian Branch of the Russian Academy of Sciences, Krasnoyarsk, Russia

The existence of space inhomogeneous superconductor insulator state (SISIS) found out earlier in polycrystalline samples of high-T_C system $Ba_{0,6}K_{0,4}BiO_3$ ($T_C \approx 30$ K) is confirmed on $Ba_{0,6}K_{0,4}BiO_3$ single crystal. At T^* ($T^* < T_C$, $T^* \approx 17$ K) the transition from the homogeneous superconducting state into the SISIS occurs. SISIS is characterized by the appearance of two gapes on the Fermi surface: semi- and superconducting, that are modulated in space in antiphase, the electric transport between superconducting regions being carried out due to Josephson tunneling. Thus the whole sample becomes a multiple Josephsone system. Nonlinear I-V curves, depended on temperature and magnetic field, that are typical to a Josephson system, are observed on $Ba_{0,6}K_{0,4}BiO_3$ single crystal at temperatures below T^*. Besides a step like peculiarities at the values of voltage of the order of one and two superconducting gaps show up. These peculiarities are suppressed by magnetic field much earlier then critical current. Perhaps the last phenomenon is the consequence of "coherent" state of several successive Josephson junctions, appeared in exfoliation state.